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Upon the Medical use
of Electricity Galvanism and Magnetism
presented to the Medical faculty
of the University of Pennsylvania
by Charles Higbee
of New Jersey
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For the degree of Doctor of Medicine

At the present day, when the practice of medicine is becoming securely established, upon foundations, which compared to those of former times, may be considered firm and unchangeable: when empiricism is about to be discarded, for ever from the profeſsion: now that diseases begin to be treated with a certainty, derived from a correct, and accurate knowledge, of their pathology. to bestow attention upon such subjects as those before us, may be considered a useleſs waste of time by many who regard them, as ridiculous Chimeras long since deservedly exploded and erased from the list of medical agents. and by others who though leſs severe in their judgment look upon them as most decidedly empirical; and perhaps as far as our knowledge yet extends this opinion may be just; nevertheleſs since nothing which promises to be of the least utility in medicine, should be entirely disregarded, it appears to me that these subjects independently of their philosophical importance have claims to the attention of the —

physician

physician, who is willing to avail himself of all the aids which nature has placed in his power. That due attention has not been bestowed on them and that they are viewed with apathy if not with contempt by the generality of medical practitioners may be inferred from observing how few ever make use of them or are even supplied with the means of doing it. Some are thus indifferent or skeptical because no satisfactory theoretical explanation can be given of the manner in which they operate, in the cure of diseases: others without regard to theory look with an eye of incredulity, because they do not consider the facts recorded in testimony of their agency as sufficiently numerous or well attested. It is my design in this essay, in the first place to enquire whether from all reasonable theories which have been adopted in explanation, of the phenomena of Electricity galvanism and magnetism; or from their acknowledged effects, we have any reason to deny their medicinal agency.

Or whether there is any thing in our knowledge, of physiology or pathology, to induce us to reject them as having no concern in the causes of life and disease. In the second place I will seek as far as my means of information extend, the facts which are recorded in testimony of their having been found serviceable, in removing disease; in order to come to a conclusion, as to whether their number and authenticity (is sufficiently) great, to induce us to yield them our confidence, even though from theory, we should be disposed, to reject them. If after pursuing these inquiries the whole subject should be found indeed chimerical, there will still be some satisfaction, in reflecting, that means, which promised so much, have not been discarded, with-out due consideration. If on the contrary it should be found, that these promises, are justified, both by reason and experience: I can only say that he, who has sufficient faith, to use them, will have in his hands a most powerful weapon, by which many diseases, even though otherwise invincible,

may be encountered, and subdued.

For the sake of perspicuity, it will be proper, to treat, of the three subjects, before us, separately. And first of Electricity; the theories relating to which; are not of a nature, to afford much interest, and from them, we can have no just grounds of reasoning, it is only by its phenomena, that we know it. and those have been gradually, unfolding themselves, to the inquiries of philosophers, from the first glimmerings, of the science, to the present day, and we have no reason to believe, that even now we have investigated the subject, so thoroughly, as to leave nothing more to be learned: it is true that experimental illustrations of the different methods of exciting, and applying it, have been so infinitely varied, as to leave as little room, to expect any thing new, in this point of view; its laws with respect to inorganic bodies, appear to be as well ascertained, as we have any reason to think, they ever will be; but here our knowledge, ceases to rest upon a firm foundation.

with regard to the nature of the fluid, and to the extent of its influence, upon organic or animal life, we know nothing with certainty, and all our conjectures, are vague and unsatisfactory; but may we not hope, that time, and patient well directed research, will unfold properties, which in point of utility, and grandeur, shall far surpass, all that is at present known, and prove, that the science, is still in its infancy: for it must be confessed that as yet, we have derived, but little advantage, from our knowledge, and beyond a few experiments, which please the eye, by their brilliancy, or astonish our imaginations, by their singularity, the science can boast, of having bestowed, but little real benefit, upon mankind: yet it cannot for a moment be supposed, that the great creator, has designed, so extraordinary a phenomenon, merely to astonish, or to terrify us: there must be, greater and nobler, ends, to be answered: and it is in physiology, pathology, and therapeutics, that we may reasonably hope, to find at least, a portion, of its effects developed. It is true that as yet all hypotheses,

which have been formed, for the purpose, of connecting electricity, with physiology and pathology, have been too wild, to merit serious consideration; yet we have grounds, to suspect, a connexion, between them: but further it is a mysterious subject, which we do not understand: whether it will always be so, rests with futurity to determine. In the mean time, it becomes us, to act and to reason, upon what we know.

Electricity, has for a great length of time, been made use of, as a Therapeutical agent. its reputation, has va-cillated, between the extremes, of the most enthusiastick admiration, and almost absolute, contempt. the first hints of its application, having been suggested, by its action upon those who were electrified, from accident or curiosity: it soon came into repute, as a universal remedy; many real cures, were effected by it; and the astonished imaginations of the patients perhaps concurring, to increase its efficacy; its power soon began to be thought miraculous. this unmerited reputation it continued to enjoy

for a time, supported, by the fabrications, and false reports of those who found an interest in administering it. but at length many experienced, and learned physicians, having turned their attention, to the subject found, that the results, of many of their experiments, did not answer, their expectations; this led them to suspect, that all the accounts, which they had heard, were false or fanciful; and that they, as well as others had been deceived, after this Electricity, fell into universal discredit, among the profession, and if made use of at all it was only by a few ignorant empiricks. later trials however, and a better acquaintance, with the science, have shown us, how far, we may confide, in its power over the human body; establishing, upon indisputable facts, that though Electricity, is not that admirable panacea, it was once considered; yet that when properly managed, and well directed, it is a harmless remedy, which sometimes, instantaneously removes, divers complaints, generally relieves, and often

how do you know this -

often, perfectly cures, various disorders; some of which, could not be removed, by the utmost endeavours, of physicians and surgeons. That it should exercise, such a controul, over diseases, ought not to excite, any great astonishment, when we reflect, that the action, of most medical agents, is involved, in equably impenetrable obscurity: all that we know, of them is that we may reasonably anticipate, certain results, from their administration, because such results, have been obtained, with tolerable certainty, in previous trials: we know that Antimony, will excite vomiting, that bark, will cure, an intermittent, that opium, will allay pain, that cantharides, will produce vesication. but how, these different effects, are produced, is a problem, of which, there is no satisfactory solution. it seems however, to be pretty generally admitted, that all substances, which have the power, of acting upon the human body, must doit, primarily, by stimulating, or exciting, the parts, with which they are in contact: and that

and that the stimulation of each, is specifick or peculiar to itself. If we examine the diseases, for which electricity, has been most frequently made use, of and compare this mode of treatment, with those, which are more ordinary, and more extensively recognised, it may poſsibly appear, that the former, has as much foundation in reason, as any of the latter. Rheumatism, gout, St Vitus dance, paralyses, Tic-doloreux, cutaneous eruptions, Scrophula, ulcers, cancers, absceſses. Ophthalmia. fistula lachrymalis, and suppreſsed secretions, particularly, the menstrual, are said to have been cured, or relieved, by variously modified, applications of electricity. Inquiring into the nature, and treatment, of a few, of these diseases, it will be seen, how far the foregoing position, is correct.

Rheumatism is thought by the best authorities to be an inflammatory affection, seated in the muscles or their appendages; it is accordingly managed, upon the general principles, established, for subduing inflammations; in its acute stage, all stimulating local applications, being of course avoided,

electricity, is entirely out of the question: in the chronickstage, the chief dependance of the physician, appears to be upon a few specifick articles, such as the savin, guaiacum, colchicum, &c, whose action is unaccountable, any farther than that they are pretty powerfully stimulant, enveloping the part in which covering of flannel, is habitually considered indispensable, friction and irritating local applications, also all tend to excite action, in the seat of the disease, though this is the established, mode of treatment, it is well known, that the relief, it affords, is very precarious; the complaint, frequently refusing, to be mitigated by it, in the slightest degree. It is then that electricity, may be had recourse to, with some prospect of advantage, nor is the rationale, of its operation, more obscure than that of the preceding remedies. most unquestionably a stimulant, its action is so peculiar, so powerful, and so pervading, that it may reasonably lay claims, to the title of a specifick. If we were to enter into speculations, upon the subject, some account, of its mode of operating, might possibly be suggested,

but as speculations are seldom valuable they may with propriety be here dispensed with.

In other inflammatory affections, as for instance in opthalmia, the plan of treatment, ordinarily pursued, after it has begun, to degenerate, into the chronick form, is by astringent washes, stimulating ointments &c. upon this principle, electricity is peculiarly appropriate, for it seems to exercise a tonic power, with-out being in any great degree irritating. if inflammation be occasioned, by a loss of tone or vitality in the capillaries, of the affected port, which disables them from resisting, the force of the fluids, driven on by the vigorous and healthy vessels, whereby they become congested, and engorged, we can easily imagine how electricity, by restoring them their tone, relieves them from congestion, and places them upon a por, with the healthy ports, of the system, nor is it assuming more than can be proved, to give to electricity a tonic power, for it may be made apparent to the sensations of every one that it can produce powerful tonic contractions

In the treatment, of suppression, of the menstrual discharge, medicines are given, which are supposed to exercise, a particular controul, over the uterus, such as the cantharides, and guaiacum, but these, in order to arrive, at the part, in which their action, is to be developed, are obliged, to pass through others, in which their presence, is injurious, violent gastritis, may be produced, before cantharides, shall have accomplished its purpose, upon the uterus. from this objection, electricity is exempt. exercising its specifick influence, immediately upon the part, through which it is directed, others are left uninjured, and the disease is cured, without creating a worse.

If cancers are occasioned, by a peculiar species, of of animalculae, or hydatids, as has been suggested, and sustained, by numerous ingenious, and forcible arguments, we shall have no difficulty in conceiving, how they are cured by electricity, for it is well known that many insects, are destroyed by it, even when it is applied in quantities, almost imperceptible. at any-

rate

since cancer is so inveterate in its nature, incurable under ordinary means, except by severe, and precarious operations, electricity has a fair claim to trial. and it may be observed, that if it should be found efficient. it would furnish a strong argument, in favour of the animalcular, origin of the disease. As a remedy for paralysis, electricity, does not appear, to be entitled to much confidence, the authors who have turned their attention, particularly to the subject, declare, that its powers, are very limited, rarely extending, to long standing cases, and not always, to the recent. from a consideration, of its pathology, we should be led to the same conclusion. for not being a local disease it is not within the reach of local remedies (rather its location is not where its chief effects are visible). The more generally received, opinion, however is, that electricity is peculiarly suited, to the cure of paralysis, supposing it to be a mere loss of irritability in the mus-

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muscles themselves, and knowing the former, to have the power, of producing, muscular contraction, it is thought that its failure in this instance, proves its entire insufficiency, in other diseases, and it is rejected without farther trial. hence from this erroneous opinion, has arisen in a great measure the neglect of this valuable remedy. It will not be neceſsary to dwell longer upon this branch of the subject, enough has been said to show that the medical use of electricity, is not entirely without foundation in reason. that experience sanctions it might easily be shown by relating the cases of its succeſsful, application, which are recorded, upon the authority of men, who were not likely to have been themselves deceived, and who cannot be suspected of willfully deceiving others. Franklin, Cavallo, Adams, Sauvages, Mauduyt, Alibert, &c who have devoted, much attention, to the subject, and made frequent trials, of its efficacy, detail

detail with much minuteneſs numerouſs highly interesting cases. from which it would appear that no little reliance, is to be placed upon it, even under the most dis-couraging circumstances. the weight of evidence which they bring, is extremely strong, and it must be admitted. that the use of the remedy upon their authority would be consistent with sound and ~~consistent~~ judicious practice.

It will next be proper to say a few words respecting the various methods of applying electricity. for considerable skill and attention will be requisite in order to adapt them properly to the end desired. it is by no means a matter of indifference whether the one or the other be resorted to all the modifications will be found of importance. for instance when it is wished to excite a gentle and diffused stimulation, throughout the system, it may be done by insulating the patient, and connecting him with an excited

excited machine; thus giving him more than the natural quantity of the fluid. in this situation the pulse is quickened, and the secretions are performed, with more energy: if it should be desired to direct the stimulation, to one part in particular, drawing the fluid from that part, will have the effect. the manner of doing this will also be of importance. where the subject of the operation, is a very delicate organ, as the eye, by using a very fine metallic point, a small and continuous, stream may be drawn, which will give, the least poſsible irritation, or pain, if this should be inefficient, a wooden-point, being leſs acute would draw a bolder stream and in consequence stimulate more highly. this effect may be still further increased, by drawing sparks with a metallic ball, held at a greater or leſs distance. and again, these may be modified, by interposing between the part to be operated upon, and the instrument, some

some slowly conducting substance as a piece of flannel; which will have a tendency, to render the action of the fluid more diffusive. Under certain circumstances, it would be dangerous to subject the patient, to the excitement of insulation, as where he is liable to apoplexy, an attack might be brought on. if in such a person, it should be desired to treat some local affection, by means of electricity, it would be more safe, to direct the fluid upon him, by any of the foregoing means, whilst he retains his connexion, with surrounding conductors. the most energetick mode of administration, and the one which is most frequently resorted to, is that of passing shocks, through the diseased structure. in this operation, great care should be taken in order to regulate their strength, for injury may be done, by having them too powerful, and as they may be varied, almost ad infinitum, they become very extensively applicable. This hasty

sketch

sketch of a few of the features of medical Electricity, may be here sufficient, to treat it fully and to the extent it merits would require volumes. With regard to galvanism, it is so nearly allied to electricity, especially in a medical point of view, that it would be useless to enter into any separate detail, respecting it; whether there is any difference in the influence, which they exercise, upon the animal economy, is not easy to determine, it is not at all unlikely however that there is, for the sensations, produced by their respective shocks, are not entirely identical: some experiments also, which have been made with galvanism, would seem to prove, a more close connexion, with the animal functions. a galvanic series has been said to have reestablished, the communication between the cut extremities, of a nerve; and its effects, upon animals recently dead, is well known. In practical importance however

Electricity must still stand highest. since it is susceptible, by means of its modifications, of being adapted to a greater variety. of circumstances, and is also, more conveniently applied. Yet it may poſsibly be hereafter discovered, that there is a peculiar power in galvanism, which will entitle it to superiority: the subject at any rate is one of great interest, and is well worthy of diligent inquiry.

Being intimately connected, with the foregoing subjects, in a philosophical point of view: Magnetism— will also claim attention, as belonging to the same claſs, of therapeutical agents. What first suggested the idea of its medicinal powers, is not easy to conceive: differing in this respect, from both electricity and galvanism, no evidence of activity, is exhibited by its application to healthy structures, it is apparently so inert, as respects the animal economy, that ordinary considerations, would not have led to its employment: most probably some superstitious-

notions. of a supernatural agency. first pointed it out. and afterwards opened a field, for a system. of charlatanry, which succeeded, for a time, in deluding the world, under the auspices of Mesmer, Perkins, and others, who with their metallic tractors, and animal magnetism, pretended to work miracles. but this mania, has subsided, and has little to do, with the subject before us: the question is simply, whether the application of a magnet, to a part affected by disease; can have any effect, in removing, or allaying it. the affirmative might appear, to superficial observation, both impoſsible and absurd. and if difficulty in explaining its operation, should be admitted, as a conclusive argument against it; it could not well be sustained. yet by the same mode of reasoning, we should have to doubt, that it points to the pole, or attracts steel; since they are equally difficult, of explanation. but repeated observation, has furnished conviction, in these latter cases. and to this alone must be referred the former.

by the test of experience, it must either stand or fall, its connexion with galvanism however may afford some clue for reasoning.

The merits of the medical use of the magnet, ~~have~~ have been fully discuſsed, by Thouret, Andry, Sparmann, and others. and from the results of numerous experiments, made or reported, by them. there is sufficient reason to believe, that ſucceſs may be anticipated, from its use, in a variety of complaints usually denominated nervous. M Laenec has found it eminently serviceable, in angina pectoris. And my own preceptor Dr Belville of Trenton, has, in the course of a very extensive practice, for a great number of years, frequently found in it a simple, speedy, and efficacious, remedy, after other resources, had been in vain exhausted. he was first induced to make trial of it, in his own person from mere curiosity, being afflicted with sciatic pains, he applied a powerful, magnet to the part, and was surprised to find, in the course of a few

minutes, that he was entirely relieved. he has since occasionally used it, in similar affections, sometimes with the most conspicuous benefit, at others without the smallest. I have frequently heard him mention, the case, of a gentleman, of great respectability, who was for a long time, most grievously tormented, with tic doloreux, occurring at irregular intervals, and for which, he had used electricity, with some transitory advantage, the doctor advised him to try, the magnet. which he did upon the next attack, and found himself very soon completely, relieved, from pain, after this he continued, to carry it in his pocket, and whenever he felt the pain return, an application of the magnet never failed to dispel it. In an other instance it was recommended, to a distinguished individual, residing near Trenton, for a rheumatic affection, in the loins and hips. it was no sooner applied, than he exclaimed, that the pain was gone. his servant witneſsing its wonderful effect obtained permiſsion to take it to his wife who was afflicted with a pain

in the head, acroſs the eyes, and extending down the face, in this case also relief, was afforded.
As to the authenticity of these, and many other similar accounts, there cannot be the smallest doubt. and however difficult it may be to explain them, they are entitled, to the authority, of facts.
In conclusion, I must say, that from what I have read, heard, and seen, in relation to, Electricity, Galvanism, and Magnetism; they appear to me, worthy of being ranked, among the most valuable, and efficacious agents, of which the science of medicine, can boast. they afford ample room, for research, and are likely to reward, any labour which may be bestowed upon them, by the most brilliant and important discoveries